# Directed Crystallization Precursor Structures in Polymer

Benjamin S. Hsiao, Stony Brook University, DMR-0405432

The aim of this research is to investigate several fundamental issues of flow-induced crystallization in polymers with an emphasis on the events occurred at the earliest stages of crystallization. These issues include the pathway of forming nanostructured scaffolds comprising microfibrils (shish) and transcrystalline lamellae (kebabs) in polymer melts under flow and its relationships with the material parameters (chain length, length distribution and chain branching) and the external flow parameters (temperature, strain and strain rate). The relevance of this work is because the final properties of polymers are direct consequences of the crystalline morphology, which is often dictated by the early structure formation under flow.

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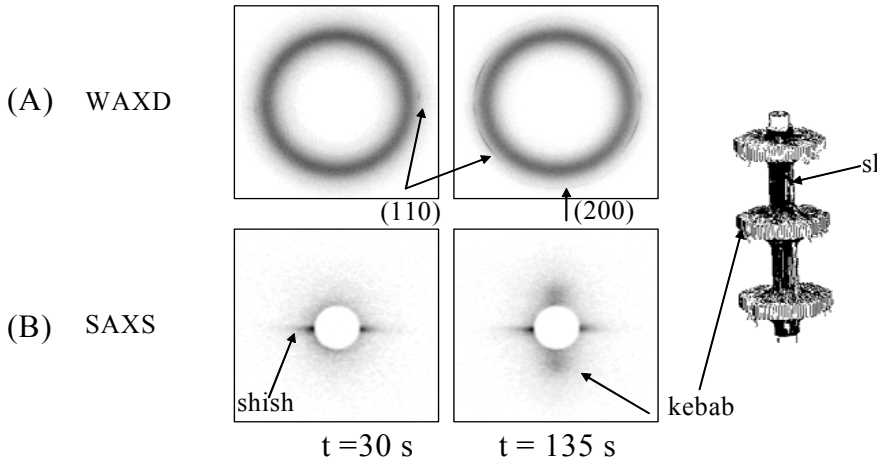
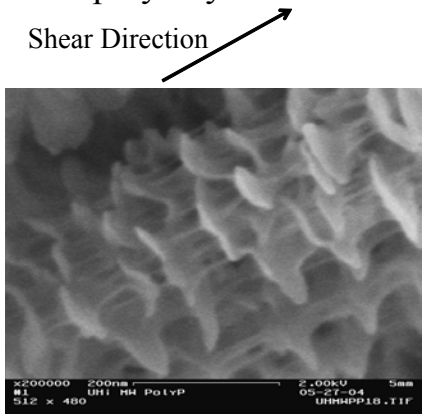



Time resolved WAXD/SAXS observation of the shish-kebab structure in polyethylene melt under shear




SEM image of toluene-extracted PE shish-kebab structure showing unexpected multiple-shish morphology

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**Education:**

This is a renewal research grant, started in the spring of 2004. Under this grant, one graduate student (Ms. Ling Yang) is about to complete her Ph.D. thesis in the summer of 2004 and one new graduate student (Mr. Feng Zuo) has just been recruited in this project. Other scientists involved in this work include: Mr. Jong Kahk Keum (3rd year graduate student), Dr. Rajesh Somani (senior scientist), Dr. Shigeyuki Toki (senior scientist) and Dr. Igors Sics (beamline scientist at X27C, National Synchrotron Light Source, Brookhaven National Laboratory)

**Outreach:**

Each summer, graduate students and post-doctoral scientists have participated in the summer high school student research programs, sponsored by the Stony Brook MRSEC and the University. The picture below shows Drs. Sics and Toki demonstrated the rheo-X-ray facility at X27C, NSLS, to Dr. Syozo Murakami, and Dr. Masatoshi Tosaka from Kyoto Univ.